

WHAT IS CLAIMED IS:

1. A purified or isolated nucleic acid encoding a $\beta 3$ sub-unit from a voltage-gated sodium channel, or a sequence complementary thereto.

2. The nucleic acid of claim 1, which encodes $\beta 3$ sub-unit from the voltage-gated sodium channel present in the rat brain, or a sequence complementary thereto.

3. The nucleic acid of claim 1, which encodes the $\beta 3$ sub-unit from the voltage-gated sodium channel present in the human brain, or a sequence complementary thereto.

4. A purified or isolated nucleic acid according to claim 1, wherein said nucleic acid encodes a polypeptide having at last 80% amino acid identity with the $\beta 3$ sub-unit polypeptide of the amino acid sequence of SEQ ID NO 1 over the entire length of the sequence of SEQ ID NO 1, or with a peptide fragment thereof, or a sequence complementary thereto, with the exception of the nucleic acid of EMMETT database having accession NO AA685538.

5. A purified or isolated nucleic acid according to claim 1, wherein said nucleic acid encodes a polypeptide having a least 80% amino acid identity with the $\beta 3$ sub-unit polypeptide of the amino acid sequence of SEQ ID NO 2 over the entire length of the sequence of SEQ ID NO 2, or a sequence complementary thereto.

6. A purified or isolated nucleic acid according to claim 1, wherein said nucleic acid has at least 90 % nucleotide identity with the nucleotide sequence of SEQ ID NO 3 over the entire length of the sequence of SEQ ID NO 3, or a sequence complementary thereto.

7. A purified or isolated nucleic acid according to claim 1, wherein said nucleic acid comprises a polynucleotide having at least 90% nucleotide identity with th sequence beginning at the nucleotide located in position 363 and ending at the nucleotide located in position 1010 of the nucleotide sequence of SEQ ID N°3.

8. A purified or isolated nucleic acid according to claim 1, wherein said nucleic acid comprises a sequence beginning at the nucleotide located in position 1 and ending at the nucleotide located in position 362 of the nucleotide sequence of SEQ ID N°3.

9. A purified or isolated nucleic acid according to claim 1, wherein said nucleic acid comprises a sequence beginning at the nucleotide located in position 1011 and ending at the nucleotide located in position 2220 of the nucleotide sequence of SEQ ID N°3.

5 10. A purified or isolated nucleic acid according to claim 1, wherein said nucleic acid has at least 90% nucleotide identity with the nucleotide sequence of SEQ ID NO 4 over the entire length of the sequence of SEQ ID NO 4, or a sequence complementary thereto.

10 11. A purified or isolated nucleic acid according to claim 1, wherein said nucleic acid comprises a polynucleotide having at least 90% nucleotide identity with the sequence beginning at the nucleotide located in position 376 and ending at the nucleotide in position 1023 of the nucleotide sequence of SEQ ID N°4.

15 12. A purified or isolated nucleic acid according to claim 1, wherein said nucleic acid comprises a sequence beginning at the nucleotide located in position 1 and ending at the nucleotide located in position 375 of the nucleotide sequence of SEQ ID N°4.

20 13. A purified or isolated nucleic acid according to claim 1, wherein said nucleic acid comprises a sequence beginning at the nucleotide located in position 1024 and ending at the nucleotide located in position 1261 of the nucleotide sequence of SEQ ID N°4.

25 14. A purified or isolated polynucleotide comprising at least 10 consecutive nucleotides of a nucleic acid encoding a $\beta 3$ sub-unit of a voltage-gated sodium channel, with the exception of the polynucleotide bearing SEQ ID NO 876 in W09845435 and the polynucleotide of EMBL database having accession NO AA685538.

15. A purified or isolated nucleic acid according to claim 14, wherein said nucleic acid comprises at least 10 consecutive nucleotides of the nucleotide sequence of SEQ ID NO 3, or a sequence complementary thereto.

30 16. A purified or isolated nucleic acid according to claim 14, wherein said nucleic acid comprises at least 10 consecutive nucleotides of the nucleotide sequence of SEQ ID NO 4, or a sequence complementary thereto.

17. A purified or isolated nucleic acid according to claim 14, wherein said nucleic acid is selected from the group consisting of SEQ ID N° 35 to 43 or a polynucleotide encoding a peptide of SEQ ID N° 5 to 32, SEQ ID N° 46 or SEQ ID N° 47.

5 18. A method for the amplification of a β 3 subunit nucleic acid, said method comprising the steps of

a) contacting a test sample suspected of containing the targeted β 3 subunit nucleic acid or a fragment thereof with amplification reaction reagents comprising a pair of amplification primers which can hybridize to a nucleic acid according to any one claims 1 to 17, and

b) optionally, detecting the amplification products.

19. The method according to claim 18, wherein the amplification primers are respectively the nucleotide sequences of SEQ ID Nos 33 and 35.

20. A kit for the amplification of a β 3 subunit nucleotide sequence, wherein said kit comprises

a) a pair of amplification primers which can hybridize to a β 3 subunit nucleic acid according to any one of claims 1 to 17, and

b) optionally, the reagents necessary for performing the amplification reaction.

21. A method for detecting the presence of polynucleotide comprising a nucleic acid according to any one of claims 1 to 17 in a sample, wherein said method comprises the steps of

a) bringing into contact a nucleic acid probe or a plurality of nucleic acid probes which can hybridize, under stringent hybridization conditions, to a nucleotide sequence included in a nucleic acid according to any one of claims 1 to 17, and the sample to be assayed;

b) detecting the hybrid complex formed between the probe or the plurality of probes and the nucleic acid in the sample.

22. The method of claim 21, wherein the nucleic acid probe or the plurality of nucleic acid probes are immobilized on a substrate.

23. The method of claim 21, wherein the nucleic acid probe or the plurality of nucleic acid probes is labeled with a detectable molecule.

24. A kit for detecting the presence of a polynucleotide comprising a nucleic acid according to any one of claims 1 to 17, wherein said kit comprises

a) a nucleic acid probe or a plurality of nucleic acid probes which can hybridize, under stringent hybridization conditions, to a nucleotide sequence included in a nucleic acid according to any one of claims 1 to 16;

b) optionally, the reagents necessary to perform the hybridization reaction.

25. The kit of claim 24, wherein the nucleic acid probe or the plurality of nucleic acid probes are immobilized on a substrate.

26. The kit of claim 24, wherein the nucleic acid probe or the plurality of nucleic acid probes are labeled with a detectable molecule.

27. A recombinant vector comprising a nucleic acid according to any one of claims 1 to 17.

28. A recombinant host cell comprising a nucleic acid according to any one of claims 1 to 17.

29. A method for producing a polypeptide encoded by a nucleic acid according to any one of claims 1 to 7, 10, 11 and, 14 to 17, wherein said method comprises the following steps of

a) culturing, in an appropriate culture medium, a host cell previously transformed or transfected with a polynucleotide according to any one of claims 1 to 7, 10, 11 and, 14 to 17;

b) harvesting the culture medium thus conditioned or lyse the host cell, for example by sonication or by osmotic shock; and c) separating or purifying, from said culture medium, or from the pellet of the resulting cell lysate, the thus produced polypeptide of interest.

30. A purified or isolated polypeptide comprising the amino acid sequence of the $\beta 3$ sub-unit from a voltage-gated sodium channel, or a peptide fragment thereof.

31. The polypeptide of claim 30, which comprises the amino acid sequence of the $\beta 3$ sub-unit from a voltage-gated sodium channel present in the rat brain, or a peptide fragment thereof.

32. The polypeptide of claim 30, which comprises the amino acid sequence of the $\beta 3$ sub-unit from a voltage-gated sodium channel present in the human brain, or a peptide fragment thereof.

33. A purified or isolated polypeptide comprising an amino acid sequence
5 having at least 90% amino acid identity with the amino acid sequence of SEQ ID NO 1 over the entire length of the sequence of SEQ ID NO 1, or a peptide fragment thereof.

34. A purified or isolated polypeptide comprising an amino acid sequence
10 having at least 90% amino acid identity with the amino acid sequence of SEQ ID NO 2 over the entire length of the sequence of SEQ ID NO 2, or a peptide fragment thereof.

35. A purified or isolated polypeptide encoded by a nucleic acid of any one of claims 1 to 7, 10, 11, 14 to 17.

36. A purified or isolated polypeptide selected from the group consisting of
15 the polypeptides of SEQ ID N° 5 to 32 and SEQ ID 46 and 47.

37. A method for screening ligand substances or molecules that are able to modulate the biological activity of a voltage-gated sodium channel containing a $\beta 3$ sub-unit, said method comprising:

(a) obtaining a recombinant host cell co-expressing a $\beta 3$ sub-unit or a
20 fragment thereof and a functional α sub-unit, preferably an $\alpha 2$ sub-unit of a voltage-gated sodium channel, or a fragment thereof;

(b) bringing into contact said recombinant host cell with a substance or molecule to be tested; and

(c) measuring an electrical parameter within the recombinant host cell
25 brought into contact with the substance or molecule to be tested through a voltage clamp technique or measurement of membrane potential by voltage sensitive fluorescent dyes.

38. A method for screening ligand substances or molecules that are able to modulate the biological activity of a voltage-gated sodium channel containing a $\beta 3$
30 sub-unit, said method comprising:

(a) contacting the ligand with the $\beta 3$ sub-unit or a fragment thereof;

(b) contacting the medium containing the ligand and the $\beta 3$ protein or a fragment thereof with a $\beta 3$ substrate and allowing the possible binding of the substrate to the $\beta 3$ protein or a fragment thereof to occur; and

(c) measuring the eventual binding of the substrate to the $\beta 3$ protein or a fragment thereof.